



Soldiers from the 3rd Cavalry Regiment at Fort Hood, Texas, use a Maintenance Support Device version 4 prototype to test a Stryker vehicle during an environmental assessment held between July and September 2017. During the assessment, nine prototypes were tested in various weather conditions and environmental elements. (Photo by Daniel Moody)

An Environmental Assessment for Maintenance Support Device Version 4

Three units conducted an environmental assessment and collected important data from exposing Maintenance Support Device version 4 prototypes to multiple weather conditions and environmental elements.

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The Maintenance Support Device (MSD) is used throughout all levels of maintenance and in every environment as the Army's at-platform automatic test system. The MSD tests and diagnoses highly complex communications, other electronic commodity equipment, missiles, aircraft, and ground vehicles to identify line replaceable unit failures.

Army ground and aviation main-

tainers use this capability in conjunction with interactive electronic technical manuals to run application software and upload and download mission data or software.

MSD version 4, as part of the integrated family of test equipment, will be the Army's sixth generation of at-platform multipurpose standard automated test equipment. Unlike its predecessors, the MSD version 4 is

being developed based on the results from the environmental assessment and will incorporate user requirements into the variants.

MSD History

The integrated family of test equipment program began in the 1980s and is required to modernize every five to seven years. Modernization efforts are accomplished through the incremental



Soldiers from the 11th Armored Cavalry Regiment at Fort Irwin, Calif., receive new equipment training on Maintenance Support Device version 4 prototypes in January 2017. (Photo by Daniel Moody)

acquisition of replacements in order to keep pace with weapons platform updates, changing diagnostic and hardware technology, significant software changes, and growing cyber challenges.

The MSD version 3 supports more than 50 weapon systems and 30 military occupational specialties. The Combined Arms Support Command's (CASCOM's) Materiel Systems Directorate is the Army's capability developer for the MSD. Today, as in the past, developing and fielding a single solution that captures the numerous requirements needed to support a growing number of systems and technologies has challenges.

The greatest challenge is providing a system of equal or greater capability than earlier MSD versions at a lower cost without compromising the technical capability or environmental requirements. The Materiel Systems Directorate is exploring options to overcome the obstacles of the past 15 years, when unique characteristics drove additional requirements and significantly increased the MSD's cost.

These increased costs limited the number of MSD version 3s that the Product Director for Test, Measurement, and Diagnostic Equipment (PD TMDE) could field. This disparity is evident in the high number of much less capable MSD version 2s that remain in Army units today.

MSD Version 4 Prototypes

In June 2016, CASCOM and PD TMDE began developing a plan to conduct an environmental assessment for MSD version 4. The purpose of the assessment was to collect information related to functionality, performance, and ruggedness.

PD TMDE procured nine commercial laptop or tablet prototypes and placed them into three levels of ruggedness: light/non-rugged (MSD version 4L), semi-rugged (MSD version 4S), and fully rugged (MSD version 4R).

While PD TMDE procured the MSD prototypes for the assessment, CASCOM coordinated with the 11th Armored Cavalry Regiment (ACR)

at Fort Irwin, California, and the 3rd Cavalry Regiment (CR) at Fort Hood, Texas, for user participation. Additionally, the Army Materiel Systems Analysis Activity (AMSAA) agreed to provide independent data collection and analysis for each assessment.

The Environmental Assessment

The environmental assessment was nine months long. The first phase, conducted with the 11th ACR, consisted of new equipment training with the user participants, prototype inventories, on-system diagnostic testing, data collection, equipment rotation with internal maintenance sections, and a feedback session. The second phase repeated these steps with the 3rd CR. An additional opportunity for assessment by a National Guard maintenance shop presented itself between the two scheduled phases.

Phase I. PD TMDE, CASCOM, and AMSAA provided the new equipment training and diagnostic troubleshooting techniques. During Phase I, the 11th ACR maintenance shop officer agreed to distribute the nine MSD version 4 prototypes equally among the maintenance shops and rotate them every 30 days to ensure the users had opportunities to evaluate each device. Surveys were developed to ensure accurate documentation was captured for each device.

After the prototype evaluations, CASCOM, PD TMDE, and AMSAA closed out the first phase of the assessment. During the first 120 days, the prototypes were exposed to multiple types of elements, including extreme temperature ranges, lubricants, fuel, sand, dust, rain, and mud.

CASCOM, PD TMDE, and AMSAA conducted feedback sessions with the 11th ACR to validate the surveys and collect information on the devices regarding performance and preferences. Maintainers recommended MSD accessory preferences such as batteries, Blu-ray Disc and DVD players, and external computer mice. The devices' ruggedness and ability to withstand drops from tactical systems was a concern.

An additional opportunity. After the 11th ACR finished assessing the devices, the Nevada National Guard Consolidated Support Maintenance Shop (CSMS) volunteered to assess a sample of the prototypes for 30 days while performing maintenance on both tactical wheeled vehicles and tracked platforms. This turned out to be an excellent time for an environmental assessment because the average temperature was 110 degrees.

The Soldiers assigned to the CSMS used the devices during daily maintenance tasks and while conducting their annual drill requirements. The comments collected from the National Guard maintainers were consistent with the 11th ACR maintainers' comments. They both had concerns about the ruggedness of the light version for their operational environment and battery performance at temperatures exceeding 100 degrees.

Phase II. In July 2017, PD TMDE shipped the prototypes to the 3rd CR. The brigade maintenance warrant officer in the regimental support squadron facilitated the internal management and distribution of the devices.

The same assessment plan used during the first phase was used for the 3rd CR in Phase II. The maintenance warrant officer established an equipment rotation plan at the midpoint of the assessment, and AMSAA provided the data collection resources with personnel assigned to Fort Hood.

The participants used each device in both garrison and field environments, which enabled a larger data collection opportunity. The Stryker systems maintainers were reluctant to use the light devices and shared concerns that they would not survive a deployment or even a field exercise.

One Soldier stated that he was concerned the MSD version 4L would not withstand an accidental drop. He was also concerned about setting it on the ground while troubleshooting the system. This concern was based on the ruggedization level, not performance specifications.

The environmental conditions that each device was exposed to with the

3rd CR were consistent with the conditions at Fort Irwin. Soldiers performed maintenance tasks during periods of dusty and sandy wind conditions, sunlight, and rain. The temperatures exceeded 105 degrees on several occasions. The environmental assessment ended in September with a feedback session during which the participants validated the surveys they submitted and had an opportunity to express any additional comments.

Assessment Results

The questionnaires collected by AMSAA with the 11th ACR, the National Guard CSMS, and the 3rd CR were filled out by personnel of more than 10 different maintenance specialties and ranks ranging from private to chief warrant officer 2. The MSD version 4R prototypes were identified as the favorite by the mechanical maintenance users.

The MSD version 4R prototypes successfully met the various maintenance mission tasks and environmental demands during the assessment. Throughout the assessment, maintainers repeatedly noted the ability of the device to display information in direct sunlight and withstand a drop from a weapon system.

The MSD version 4S prototypes met the maintenance mission's tasks, but most of the semi-rugged prototypes experienced functional problems when exposed to temperatures above 105 degrees.

The MSD version 4L prototypes were not preferred by the maintainers because they were not rugged enough. The continual theme throughout the assessment was that the light devices would work only in an office environment or in a shop shelter.

This assessment will serve as a validation resource for CASCOM and PD TMDE. The information collected over the nine-month period will be used to focus on specific areas. Unlike the MSD version 3, which possesses a single line item number (LIN) and basis of issue plan (BOIP), the MSD version 4 has multiple LINs and BOIPs

to support the wide spectrum of user requirements. CASCOM will use the assessment results to develop the BOIP for each MSD version 4 LIN.

The maintainers identified some performance attributes that the MSD needs. These attributes include a fully ruggedized device that can withstand an occasional drop, a display that can be read in bright sunlight for diagnostic testing outdoors, and the ability to maintain operational performance during temperatures of at least 110 degrees.

PD TMDE will use the assessment results as a reference resource and will validate user preferences based upon mission requirements. The MSD version 4 variants are scheduled for a contract award in fiscal year 2018. Fielding is scheduled to begin in 2019.

PD TMDE's innovative acquisition approach for the MSD version 4, which thoroughly analyzes user requirements and categorically applies them to multiple LINs, will result in a manageable, funded program that has the potential to provide maintainers with a fully operational capability.

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